# REE Value

# Report on the Review of Energy Audits

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# Executive Summary

This deliverable, from the REEValue project funded by the EU's LIFE program, reviews energy audits conducted across Malta, Bulgaria, Finland, Greece, Ireland, Italy, and Portugal. The aim is to identify opportunities for energy efficiency and ensure compliance with the EU/2023/1791 Energy Efficiency Directive. The report outlines the methodology used for data collection and analysis, noting that the directive mandates energy audits for companies with annual consumption exceeding 10TJ.

The audits revealed differences in energy consumption patterns between SMEs and non-SMEs across the surveyed countries. In Malta, non-SMEs primarily used electricity and heavy oil, while SMEs also utilised diesel oil and LPG. In Bulgaria, non-SMEs favoured natural gas and electricity, whereas SMEs predominantly used natural gas. Finland's non-SMEs mainly consumed natural gas, with a smaller share of electricity, while SMEs had a similar pattern but with lower overall energy consumption. In Greece, non-SMEs used a mix of natural gas, heavy oil, and electricity, while SMEs relied heavily on heavy oil. Italy's data showed non-SMEs primarily using natural gas and electricity, with no data available for SMEs. In Portugal, SMEs mainly consumed heavy oil, with significant use of electricity and natural gas, but no data was available for non-SMEs. The report also identified a significant lack of data in the transport sector, which limits a comprehensive assessment of fuel usage and efficiency across these regions.

A total of 515 recommendations were provided for improving energy efficiency, categorised into various areas. In renewable systems, the most common recommendation was the installation of photovoltaic (PV) systems. For HVAC systems, upgrading to high-efficiency units and improving insulation were frequently advised. In lighting, the transition to LED lighting was the primary recommendation. For electrical and mechanical systems, installing variable speed drives on motors was commonly suggested. Transportation recommendations included the adoption of eco-driving practices and the use of electric or hybrid vehicles. Building improvements often focused on enhancing insulation and installing energy-efficient windows. In refrigeration, upgrading to more efficient units was a key recommendation. Finally, the adoption of energy monitoring and management systems was emphasised to track and reduce energy consumption.

The report emphasises the need for better data on Key Performance Indicators (KPIs) to enhance the evaluation of energy efficiency measures. Challenges in the analysis were noted, particularly inconsistencies in data collection, highlighting the need for improved data practices in future projects.

The report concludes by summarising the findings and outlining the next steps for advancing energy efficiency strategies and improving data collection to support the LIFE REEValue project's goals.

# Introduction - Data Collection Process

Data collection is a fundamental aspect of energy management, enabling businesses to gain insights into their energy usage patterns, identify areas for improvement, and implement strategies to enhance efficiency and sustainability. In the context of our collaborative efforts among partners, a comprehensive Excel template was developed to streamline the data collection process from the energy audits. These audits were collected from the following countries: Malta, Bulgaria, Finland, Greece, Ireland, Italy, and Portugal. This template encompasses various sections tailored to capture essential information about the company's operations, energy consumption, key performance indicators (KPIs), energy efficiency measures, and renewable energy initiatives.

The Excel template, devised collectively by all partners, incorporates sections covering General Company Data, Electricity, Different Fuel Types (such as Natural Gas, LPG, Diesel Oil, and Heavy Oil), Transport Energy Consumption, KPIs, Recommendations to Improve Energy Efficiency and Renewable Energy. Each section serves a distinct purpose in gathering pertinent information essential for assessing energy usage and formulating actionable insights.

The General Company Data section aims to gather basic information about the company, including its size classification (Large, Medium, Small), NACE code, total consumption of production and transport, and other relevant details. To reduce the amount of NACE classes the report groups them into several main NACE codes (according to the main NACE division) as follows:

*Table 1 - Nace Classification*

| **Nace C10 Manufacture of Food Products** | |
|---|---|
| NACE Classes that are Present in the Energy Audits and are Listed as Nace C10 | |
| C10.1 | Processing and Preserving of Meat and Production of Meat Products |
| C10.4 | Manufacture of Vegetable and Animal Oils and Fats |
| C10.5 | Manufacture of Dairy Products |
| C10.6 | Manufacture of Grain Mill Products, Starches and Starch Products |
| C10.7 | Manufacture of Bakery and Farinaceous Products |
| C10.8 | Manufacture of Other Food Products |
| C10.9 | Manufacture of Prepared Animal Feeds |
| **Nace C11 Manufacture of Beverages** | |
| NACE Classes that are Present in the Energy Audits and are Listed as Nace C11 | |
| C11.01 | Distilling, Rectifying and Blending of Spirits |
| C11.02 | Manufacture of Wine from Grape |

| | |
|---|---|
| C11.03 | Manufacture of Cider and Other Fruit Wines |
| C11.05 | Manufacture of Beer |
| C11.06 | Manufacture of Malt |
| C11.07 | Manufacture of Soft Drinks; Production of Mineral Waters and Other Bottled Waters |
| **Nace G46 Wholesale Trade, Except for Motor Vehicles and Motorcycles** | |
| NACE Classes that are Present in the Energy Audits and are Listed as Nace G46 | |
| G46.3 | Wholesale of Food, Beverages and Tobacco |
| **Nace G47 Retail Trade, Except for Motor Vehicles and Motorcycles** | |
| NACE Classes that are Present in the Energy Audits and are Listed as Nace G47 | |
| G47.1 | Retail Sales in Non-Specialised Stores |
| G47.2 | Retail Sale of Food, Beverages and Tobacco in Specialised Stores |
| **Nace H49 Land Transport and Transport Via Pipelines** | |
| NACE Classes that are Present in the Energy Audits and are Listed as Nace H49 | |

| | |
|---|---|
| H49.2 | Freight Rail Transport |
| H49.3 | Other Passenger Land Transport |
| H49.4 | Freight Transport by Road and Removal Services |
| **Nace H50 Water Transport** | |
| NACE Classes that are Present in the Energy Audits and are Listed as Nace H50 | |
| H50.2 | Sea and Coastal Freight Water Transport |

The sections dedicated to electricity and various fuel types delve into the specifics of energy sources utilised in the company's production processes. This information provides insights into the energy mix, enabling stakeholders to evaluate the environmental impact and explore opportunities for optimisation.

The Transport section is instrumental in identifying the types of fuels utilised in the company's transportation activities, shedding light on another significant aspect of energy consumption within the organisation.

Key Performance Indicators (KPIs) serve as vital metrics for monitoring and benchmarking energy efficiency performance. By tracking electrical-specific and thermal-specific energy consumption for both production processes and transportation, stakeholders can gauge the effectiveness of energy management initiatives.

The Energy Efficiency section compiles recommendations derived from conducted energy audits, highlighting potential efficiency improvements, associated investment costs, payback periods, and barriers to implementation. This data aids in prioritising energy-saving measures and understanding the financial implications of implementation decisions.

Lastly, the Renewable Energy section focuses on assessing opportunities for integrating renewable energy sources into the company's energy portfolio. Information regarding recommended renewable energy initiatives, costs, self-consumption, self-sufficiency, payback periods, and implementation status provides insights into the feasibility and impact of renewable energy adoption.

Following the collaborative development of the Excel template, it underwent iterative feedback cycles among partners to ensure its efficacy and relevance. Subsequently, partners commenced filling the template with existing energy audit data, accumulating 129 energy audits, which serves as a robust foundation for further analysis and strategic planning.

# The New Energy Efficiency Directive – Energy Audit Obligation

The sample audits collected are based on mandatory audits for large companies and voluntary audits for SMEs. The revised Energy Efficiency Directive (EU/2023/1791) no longer defines the energy audit obligation based on company size but rather on energy consumption. Companies consuming more than 10TJ shall be required to conduct an energy audit. This consumption figure was used to determine how many companies shall be

| Comparison of Energy Audit Requirements Based on Energy Consumption Levels (Threshold: 10TJ) by Enterprise Size | | |
| --- | --- | --- |
| | Small and medium-sized enterprises (SMEs) | Large enterprises (Non -SMEs) |
| An Energy Audit shall be required | 11 | 55 |
| An Energy Audit shall not be required | 33 | 28 |
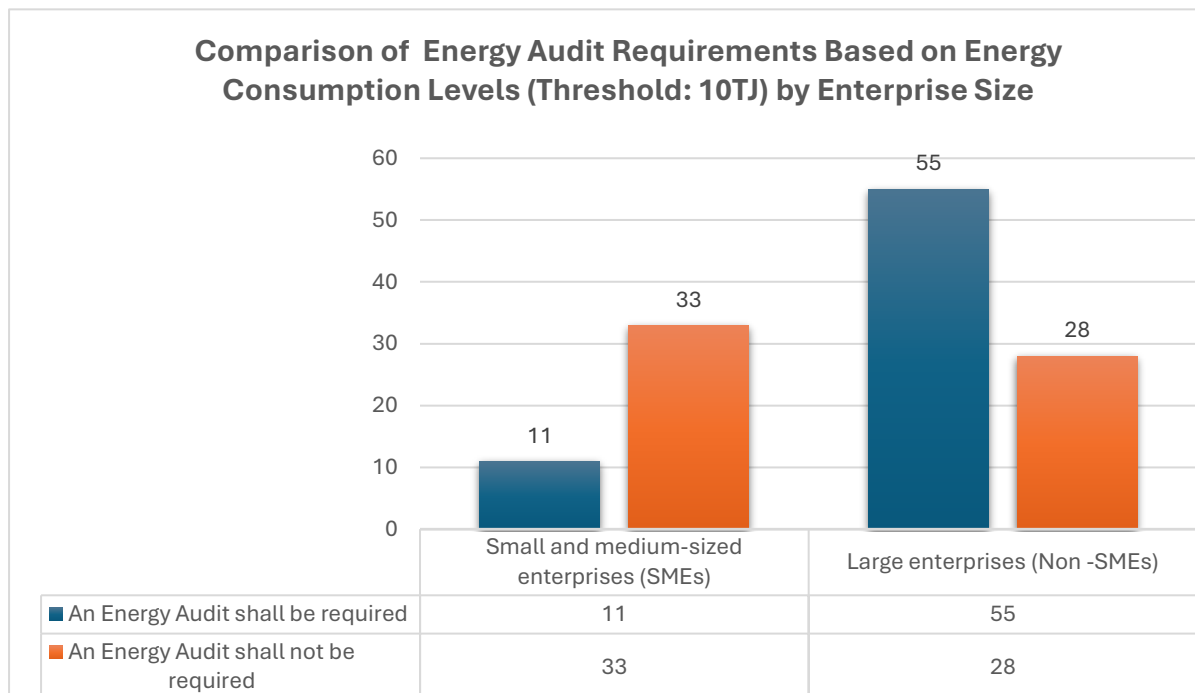
*Figure 1-Comparison of Energy Audit Requirements Based on Energy Consumption Levels (Threshold: 10TJ) by Enterprise Size*

changing their obligation requirements under the revised Energy Efficiency Directive, assuming current energy levels.

This bar chart illustrates the upcoming energy audit obligations for companies based on their current energy consumption levels. The data shows that among the surveyed companies, 61 shall not require an energy audit as their energy consumption is below the 10TJ (terajoules) threshold. Previously the number of companies which were not required to carry out an energy audit stood at 44 based on the new directive, 66 companies shall have to conduct an energy audit due to their consumption exceeding the 10TJ threshold. From the current sample, there are 28 large companies which shall no longer be required to carry out an energy audit. Overall based on the collected audits, fewer companies shall be required to carry out an audit while 55 shall be mandated to undergo audits.

Breaking it down further, of the 44 small and medium-sized enterprises (SMEs) surveyed, 11 shall be required to conduct energy audits, while the majority, 33 SMEs, shall fall below the threshold and be exempt. According to the revised Energy Efficiency Directive EU/2023/1791, enterprises that exceed the threshold must carry out an energy audit at least every four years.

# Distribution of Energy Audits

*Comparison of Energy Breakdown (in kWh and percentage) in NACE C between Non-SME's and SME's in Malta (Excluding Transport)*

### AVERAGE ENERGY CONSUMPTION FOR NON-SME'S (NACE C)

Heavy Oil , 5,970,111, 46%

Electricity, 6,573,484, 51%

Diesel Oil, 0, 0%

LPG, 445,994, 3%

Natural Gas , 0, 0%

### AVERAGE ENERGY CONSUMPTION FOR SME'S (NACE C)

Diesel Oil, 685,201, 19%

Heavy Oil , 483, 0%

LPG, 576,362, 16%

Natural Gas , 0, 0%

Electricity, 2,301,279, 65%

*Figure 2-Comparison of Energy Breakdown in NACE C between Non-SME's and SME's in Malta (Excluding Transport)*

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE C from Malta, based on data from the energy audits. There were seven energy audits for both non-SMEs and SMEs. These energy audits cover multiple years, with the energy data varying from 2018 to 2021, while the audits.

The first pie chart shows that non-SMEs primarily consume electricity, accounting for 51% (6,573,484 kWh) of their energy use, and heavy oil, comprising 46% (5,970,111 kWh). LPG contributes a minor 3% (445,994 kWh), while diesel oil and natural gas are not used at all.

The second pie chart represents the energy consumption for SMEs, where electricity is also the most used energy source, making up 65% (2,301,279 kWh) of the total consumption. Diesel oil is the second most consumed energy type at 19% (685,201 kWh), followed by LPG at 16% (576,362 kWh). Similar to non-SMEs, SMEs show negligible usage of heavy oil and natural gas, with heavy oil consumption at 0% (483 kWh) and natural gas at 0 kWh.

Overall, both charts highlight that electricity is the predominant energy source for non-SMEs and SMEs. Non-SMEs also significantly rely on heavy oil, whereas SMEs have a more diversified energy mix that includes a substantial amount of diesel oil and LPG.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE C between Non-SME and SME's in Bulgaria (Excluding Transport)



Figure 3 - Comparison of Energy Breakdown in NACE C between Non-SME and SME's in Bulgaria (Excluding Transport)

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE C from Bulgaria, based on data from energy audits. There were three energy audits conducted for non-SMEs and six for SMEs. These audits encompass data from 2019 to 2022, with the audits conducted between 2020 and 2023.

The first pie chart shows that non-SMEs primarily consume natural gas, accounting for 52% (2,060,876 kWh) of their energy use, and electricity, comprising 46% (1,791,084 kWh). Diesel oil contributes a minor 2% (86,630 kWh), while LPG and heavy oil are not used at all.

The second pie chart represents the energy consumption for SMEs, where natural gas is overwhelmingly the most used energy source, making up 98% (99,592,941 kWh) of the total consumption. Electricity is the second most consumed energy type at 2% (2,340,356 kWh). Similar to the first chart, this set shows negligible usage of diesel oil, LPG, and heavy oil, with all three energy types at 0%.

Overall, the charts highlight different energy consumption patterns between non-SMEs and SMEs. The non-SMEs pie chart indicates a more balanced consumption between natural gas and electricity. In contrast, SME's pie chart shows that natural gas is primarily used with minimal usage of electricity and no use of the other fuel types.

## *Comparison of Energy Breakdown (in kWh and percentage) in NACE C between Non-SME and SME's in Finland (Excluding Transport)*



**AVERAGE ENERGY CONSUMPTION FOR NON-SME'S (NACE C)**

Diesel Oil, 0, 0%
LPG, 0, 0%
Heavy Oil , 0, 0%
Electricity, 14,341,185, 31%
Natural Gas , 31,988,269, 69%

**AVERAGE ENERGY CONSUMPTION FOR SME'S (NACE C)**

LPG, 0, 0%
Heavy Oil , 0, 0%
Diesel Oil, 0, 0%
Electricity, 2,053,000, 30%
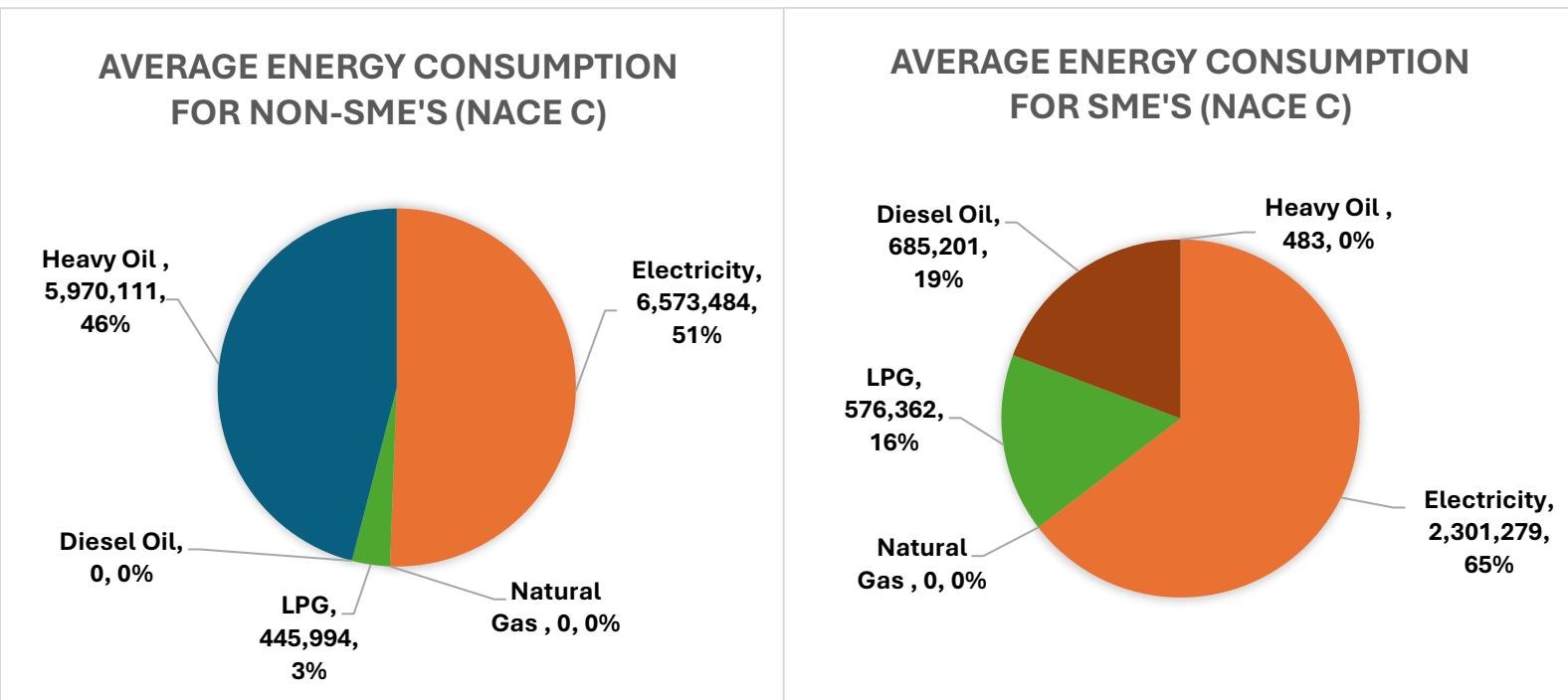Natural Gas , 4,718,500, 70%

*Figure 4 - Comparison of Energy Breakdown in NACE C between Non-SME and SME's in Finland (Excluding Transport)*

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE C from Finland, based on data from energy audits. There were 27 energy audits conducted for non-SMEs and two for SMEs. These audits encompass data from 2017 to 2022, with the energy audits conducted between 2018 and 2023.

The first pie chart shows that non-SMEs primarily consume natural gas, accounting for 69% (31,988,269 kWh) of their energy use, and electricity, comprising 31% (14,341,185 kWh). Diesel oil, LPG, and heavy oil are not used at all.

The second pie chart represents the energy consumption for SMEs, where natural gas is the most used energy source, making up 70% (4,718,500 kWh) of the total consumption. Electricity is the second most consumed energy type at 30% (2,053,000 kWh). Similar to non-

SMEs, this set shows negligible usage of diesel oil, LPG, and heavy oil, with all three energy types at 0%.

Overall, the charts highlight similar energy consumption patterns between non-SMEs and SMEs, with both primarily relying on natural gas followed by electricity, and negligible usage of diesel oil, LPG, and heavy oil.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE C between Non-SME and SME's in Greece (Excluding Transport)
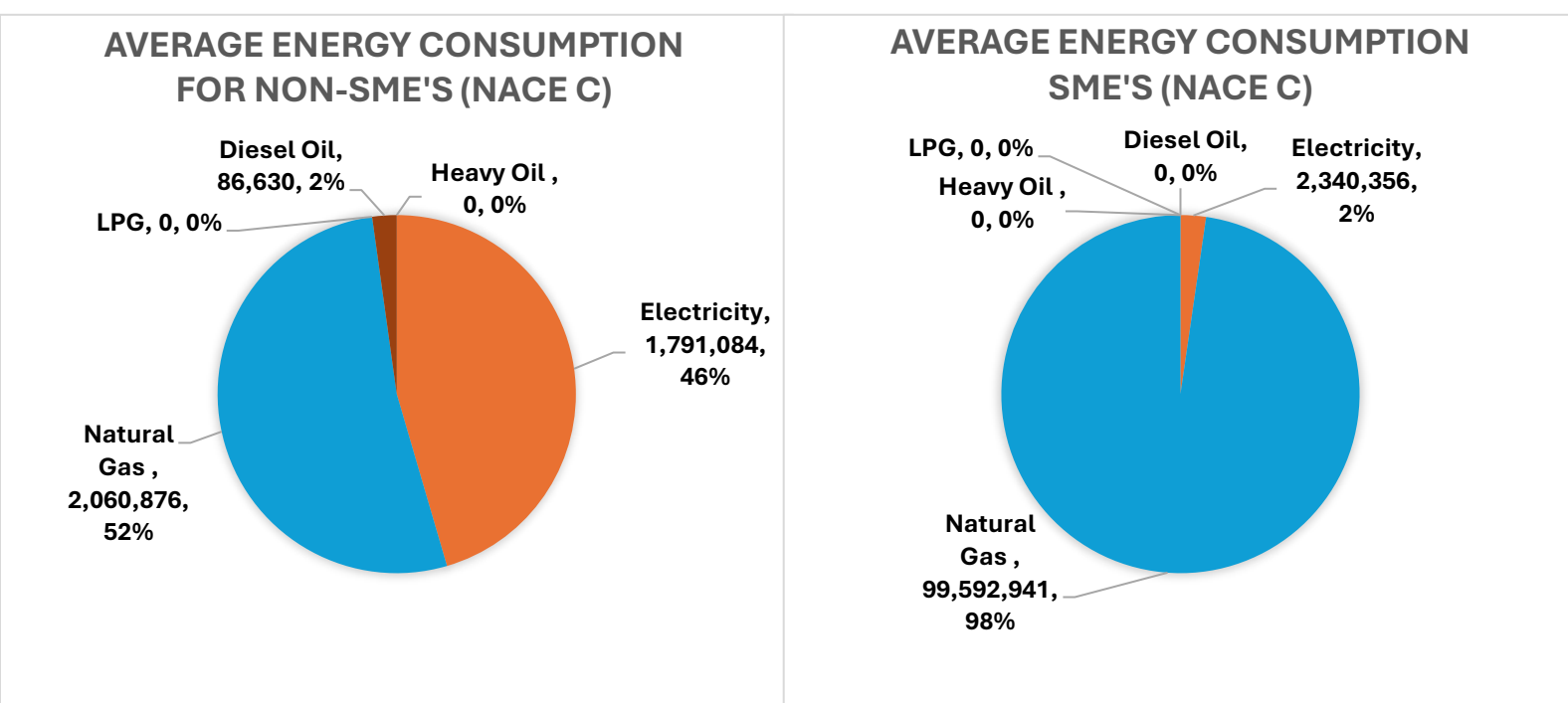


*Figure 5- Comparison of Energy Breakdown in NACE C between Non-SME and SME's in Greece (Excluding Transport)*

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE C from Greece, based on data from energy audits. There were eight energy audits conducted for non-SMEs and seven for SMEs. These audits encompass data from 2015 to 2022, with the audits conducted between 2017 and 2023.

The first pie chart shows that non-SMEs primarily consume natural gas, accounting for 31% (11,203,729 kWh) of their energy use, and heavy oil, also comprising 31% (11,214,719 kWh). Electricity makes up 22% (8,034,678 kWh), while LPG contributes 16% (5,687,210 kWh). Diesel oil contributes a minor 0% (92,937 kWh).

The second pie chart represents the energy consumption for SMEs, where heavy oil is the most used energy source, making up 80% (15,175,667 kWh) of the total consumption. Electricity is the second most consumed energy type at 11% (2,143,013 kWh), followed by natural gas at 9% (1,623,100 kWh). LPG and diesel oil have negligible usage, each contributing 0% (3,273 kWh and 99,310 kWh, respectively).

Overall, the charts highlight different energy consumption patterns between non-SMEs and SMEs. Non-SMEs have a more diversified energy mix with significant use of natural gas, heavy oil, electricity, and LPG, whereas SMEs predominantly rely on heavy oil with notable consumption of electricity and natural gas.

## *Comparison of Energy Breakdown (in kWh and percentage) in NACE C between Non-SME and SME's in Italy (Excluding Transport)*



*Figure 6- Comparison of Energy Breakdown in NACE C between Non-SME and SME's in Italy (Excluding Transport)*

The pie charts illustrate the average energy consumption for Non-SMEs in NACE C from Italy, based on data from energy audits. There were three energy audits conducted for non-SMEs, and no energy audits were provided for SMEs. These audits encompass data from the year 2022, with the audits conducted in 2023.

The first pie chart shows that non-SMEs primarily consume natural gas, accounting for 55% (25,553,067 kWh) of their energy use, and electricity, comprising 45% (21,164,337 kWh). Diesel oil, LPG, and heavy oil are not used at all.

No energy audits were provided for SMEs from Italy, so their energy consumption data is not available.

Overall, the chart for non-SMEs highlights a significant reliance on both natural gas and electricity, with no usage of diesel oil, LPG, or heavy oil. The absence of data for SMEs means no comparison can be made for their energy consumption patterns.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE C between Non-SME and SME's in Portugal (Excluding Transport)
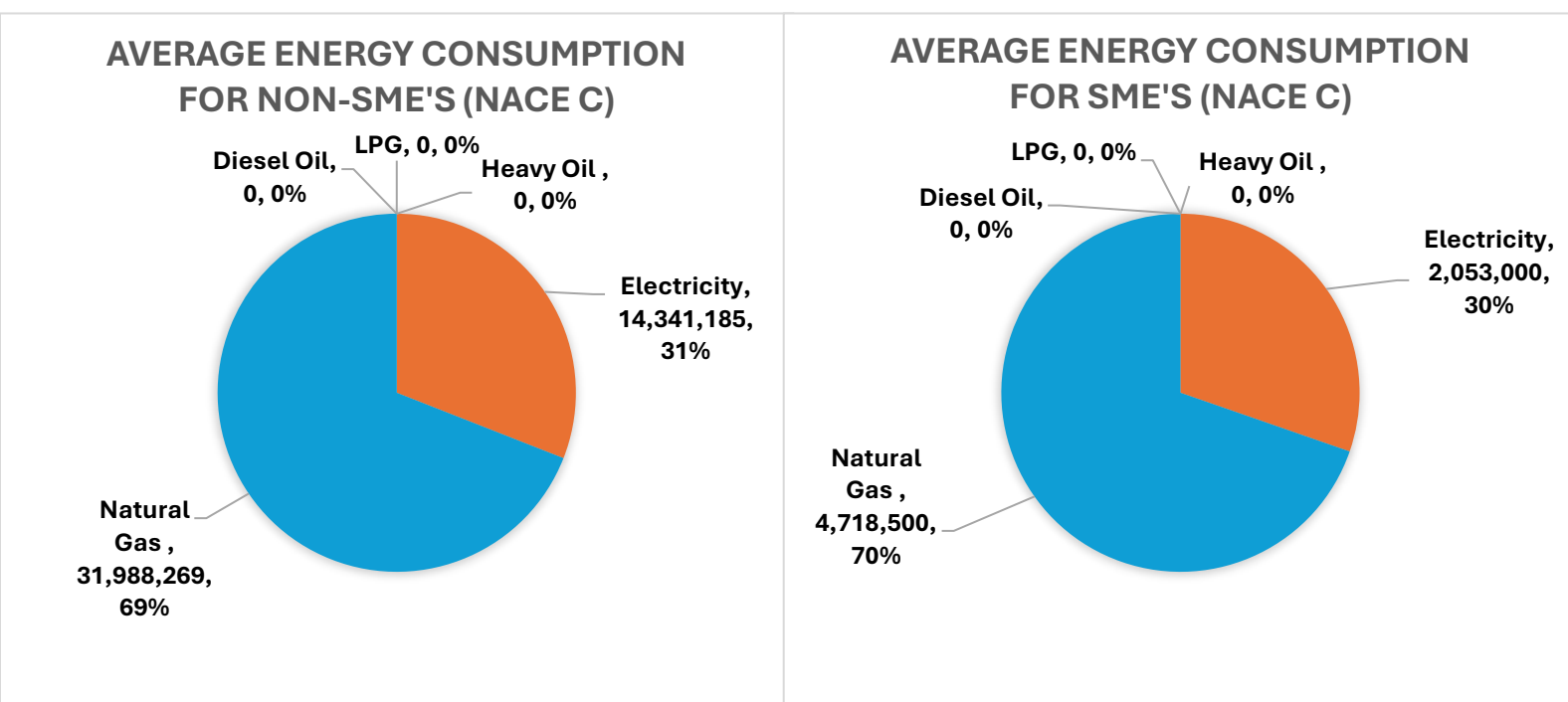


*Figure 7- Comparison of Energy Breakdown in NACE C between Non-SME and SME's in Portugal (Excluding Transport)*

The pie chart illustrates the average energy consumption for SMEs in NACE C from Portugal, based on data from energy audits. There were two energy audits conducted for SMEs, and no energy audits were provided for non-SMEs. These audits encompass data from 2019 to 2021, with the audits conducted in 2022.

No energy audits were provided for non-SMEs from Portugal, so their energy consumption data is not available.

The second pie chart shows that SMEs primarily consume heavy oil, accounting for 80% (15,175,667 kWh) of their energy use. Electricity makes up 11% (2,143,013 kWh), followed by natural gas at 9% (1,623,100 kWh). LPG and diesel oil contribute negligibly, each at 0% (3,273 kWh and 99,310 kWh, respectively).

Overall, the chart for SMEs highlights a significant reliance on heavy oil, with substantial contributions from electricity and natural gas, and negligible usage of LPG and diesel oil. The absence of data for non-SMEs means no comparison can be made for their energy consumption patterns.

## *Comparison of Energy Breakdown (in kWh and percentage) in NACE G between Non-SME and SME's in Malta (Excluding Transport)*
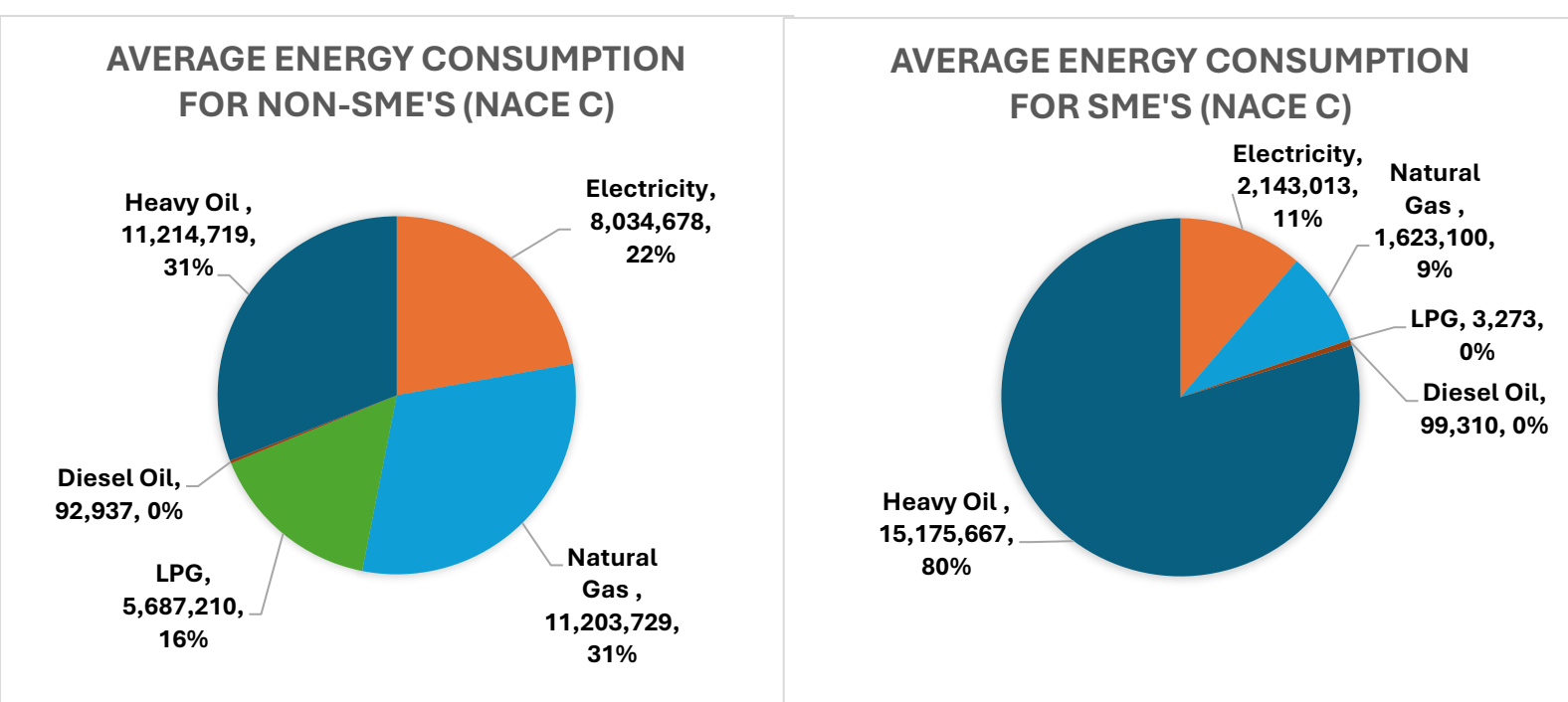


*Figure 8- Comparison of Energy Breakdown in NACE G between Non-SME and SME's in Malta (Excluding Transport)*

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE G from Malta, based on data from energy audits. There were 15 energy audits conducted for non-SMEs and 16 for SMEs. These energy audits encompass data from 2015 to 2022, with the energy audits conducted between 2015 and 2022.

The first pie chart shows that non-SMEs exclusively consume electricity, accounting for 100% (1,916,713 kWh) of their energy use. Diesel oil, LPG, heavy oil, and natural gas are not used at all.

The second pie chart shows that SMEs also exclusively consume electricity, accounting for 100% (154,788 kWh) of their energy use. Similar to non-SMEs, SMEs do not use diesel oil, LPG, heavy oil, or natural gas.

Overall, both charts highlight that electricity is the sole energy source for both non-SMEs and SMEs in NACE C from Malta, with no usage of diesel oil, LPG, heavy oil, or natural gas.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE G between Non-SME and SME's in Bulgaria (Excluding Transport)



**AVERAGE ENERGY CONSUMPTION FOR NON-SME'S (NACE G)**

LPG, 0, 0%
Diesel Oil, 0, 0%
Heavy Oil , 0, 0%
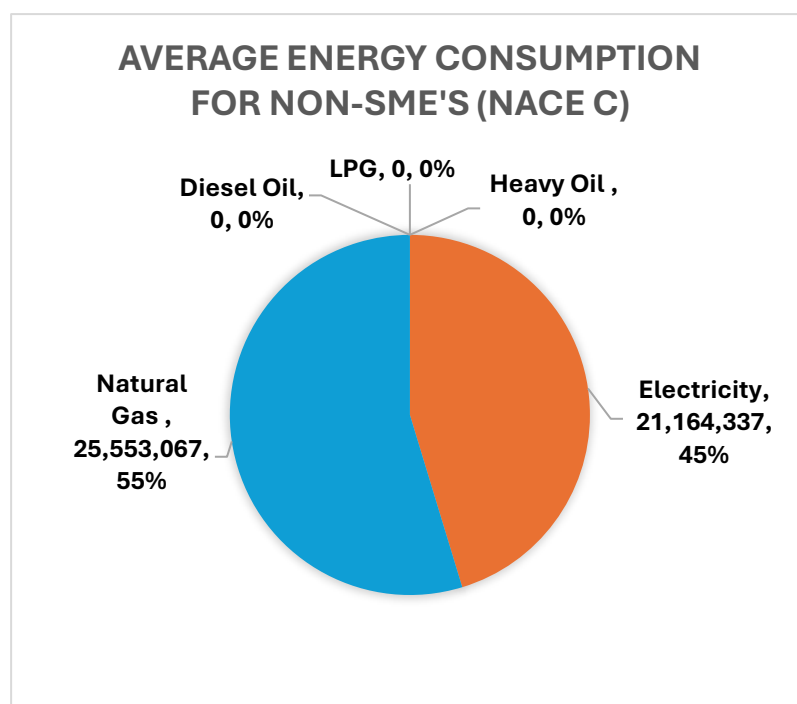Natural Gas , 1,673,850, 30%
Electricity, 3,850,922, 70%

*Figure 9- Comparison of Energy Breakdown in NACE G between Non-SME and SME's in Bulgaria (Excluding Transport)*

The pie chart illustrates the average energy consumption for Non-SMEs in NACE G from Bulgaria, based on data from energy audits. There was one energy audit conducted for non-SMEs, and no energy audits were provided for SMEs. These energy audits encompass data from the year 2021, with the energy audit conducted in 2022.

The pie chart shows that non-SMEs primarily consume electricity, accounting for 70% (3,850,922 kWh) of their energy use, and natural gas, comprising 30% (1,673,850 kWh). Diesel oil, LPG, and heavy oil are not used at all.

No energy audits were provided for SMEs from Bulgaria, so their energy consumption data is not available.

Overall, the chart highlights a significant reliance on electricity and natural gas for non-SMEs, with no usage of diesel oil, LPG, or heavy oil. The absence of data for SMEs means no comparison can be made for their energy consumption patterns.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE G between Non-SME and SME's in Finland (Excluding Transport)



**AVERAGE ENERGY CONSUMPTION FOR NON-SME'S (NACE G)**

LPG, 0, 0%
Diesel Oil, 0, 0%
Heavy Oil , 0, 0%
Electricity, 2,917,333, 45%
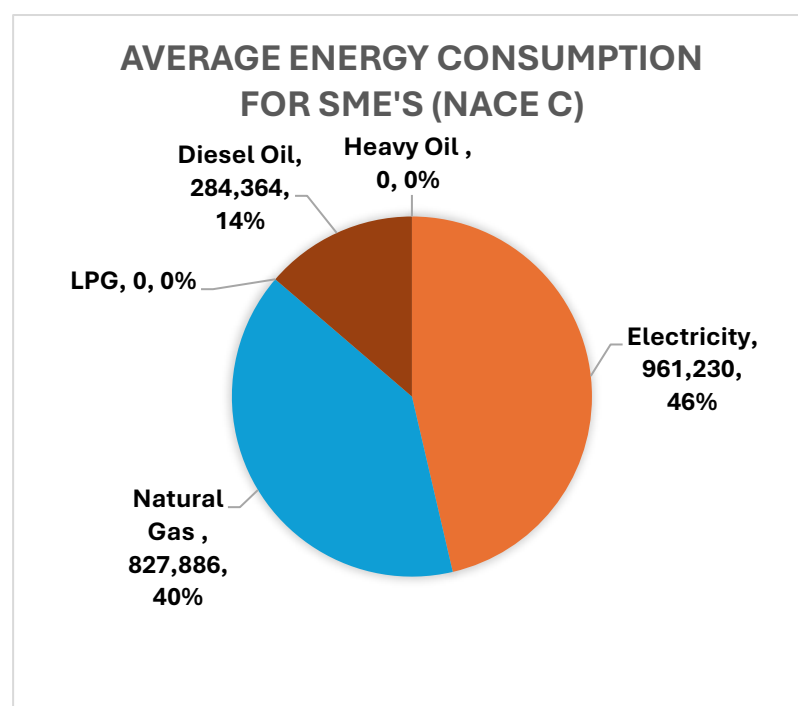Natural Gas , 3,516,000, 55%

*Figure 10- Comparison of Energy Breakdown in NACE G between Non-SME and SME's in Finland (Excluding Transport)*

The pie chart illustrates the average energy consumption for Non-SMEs in NACE G from Finland, based on data from energy audits. There were three energy audits conducted for non-SMEs, and no energy audits were provided for SMEs. These energy audits encompass data from 2017 to 2018, with the energy audits conducted between 2018 and 2019.

The pie chart shows that non-SMEs primarily consume natural gas, accounting for 55% (3,516,000 kWh) of their energy use, and electricity, comprising 45% (2,917,333 kWh). Diesel oil, LPG, and heavy oil are not used at all.

No energy audits were provided for SMEs from Finland, so their energy consumption data is not available.

Overall, the chart highlights a significant reliance on natural gas and electricity for non-SMEs, with no usage of diesel oil, LPG, or heavy oil. The absence of data for SMEs means no comparison can be made for their energy consumption patterns.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE G between Non-SME and SME's in Greece (Excluding Transport)
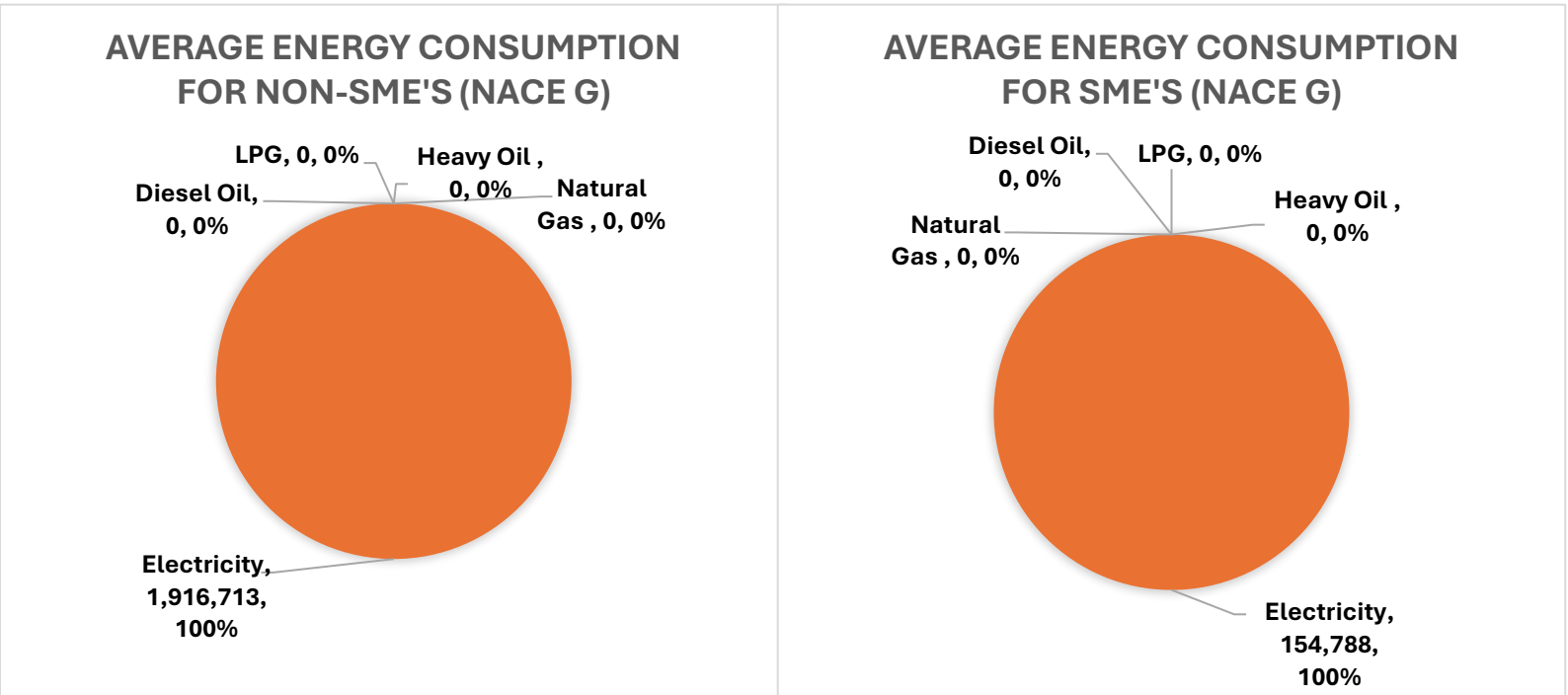


*Figure 11- Comparison of Energy Breakdown in NACE G between Non-SME and SME's in Greece (Excluding Transport)*

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE G from Greece, based on data from energy audits. There were 11 energy audits conducted for non-SMEs and one for SMEs. These energy audits encompass data from 2015 to 2022, with the energy audits conducted between 2018 and 2023.

The first pie chart shows that non-SMEs primarily consume natural gas, accounting for 55% (3,516,000 kWh) of their energy use, and electricity, comprising 45% (2,917,333 kWh). Diesel oil, LPG, and heavy oil are not used at all.

The second pie chart shows that SMEs exclusively consume electricity, accounting for 100% (154,788 kWh) of their energy use. Similar to non-SMEs, SMEs do not use diesel oil, LPG, heavy oil, or natural gas.

Overall, the charts highlight different energy consumption patterns between non-SMEs and SMEs. Non-SMEs rely significantly on both natural gas and electricity, with no usage of diesel oil, LPG, or heavy oil. In contrast, SMEs rely exclusively on electricity, with no usage of diesel oil, LPG, heavy oil, or natural gas.

## *Data Exclusion Due to Company Confidentiality in Malta's NACE H Sector*

Due to the sensitive nature of the company data and the small number of companies operating in the NACE H sector in Malta, there is a high risk of identifying the individual company. To ensure confidentiality and protect its privacy, we will exclude this specific data from our report.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE H between Non-SME and SME's in Bulgaria (Excluding Transport)

**AVERAGE ENERGY CONSUMPTION FOR NON-SME'S (NACE H)**

Diesel Oil, 676,633, 14%

Heavy Oil , 0, 0%

Natural Gas , 0, 0%

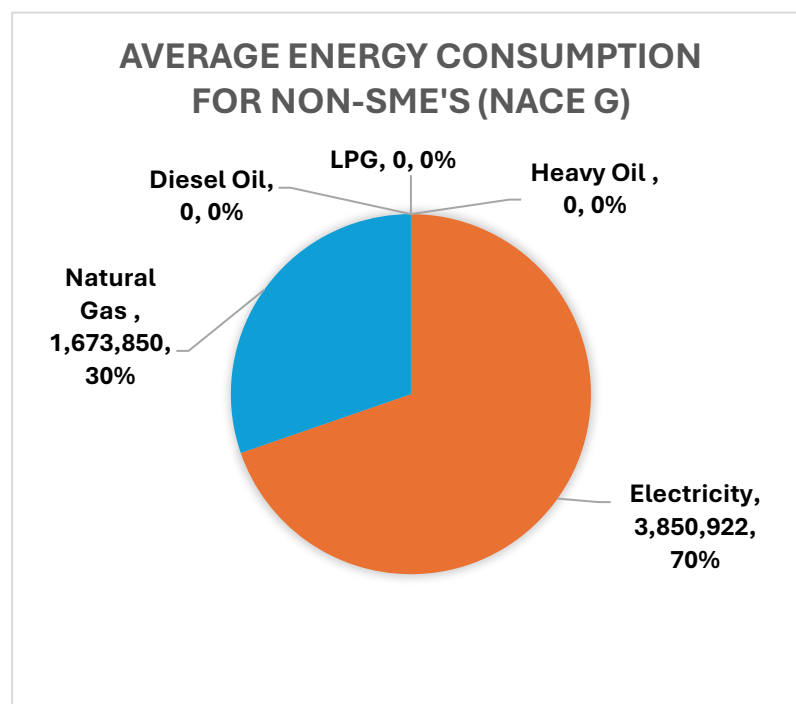LPG, 0, 0%

Electricity, 4,203,667, 86%
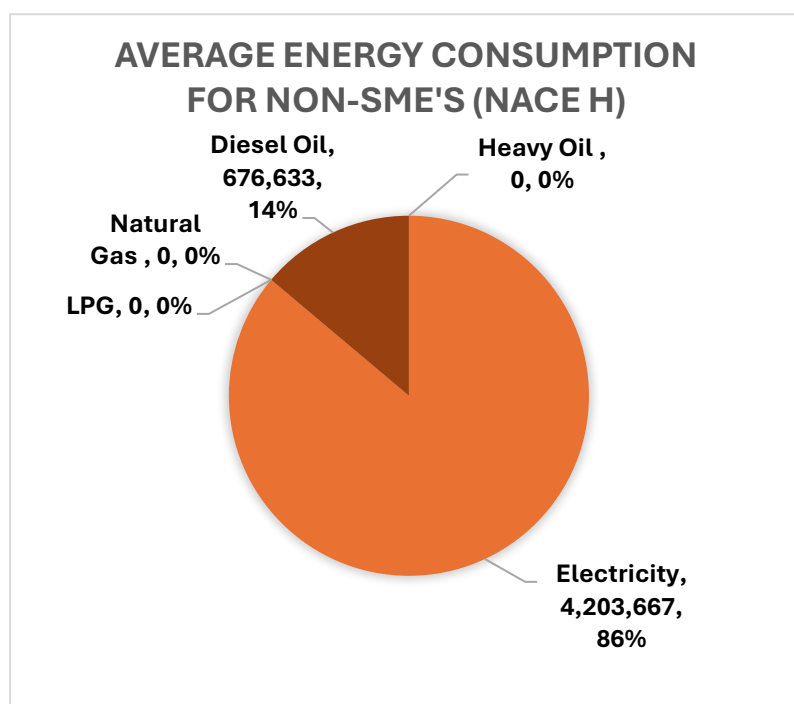
*Figure 12- Comparison of Energy Breakdown in NACE H between Non-SME and SME's in Bulgaria (Excluding Transport)*

The pie chart illustrates the average energy consumption for Non-SMEs in NACE H from Bulgaria, based on data from energy audits. There was one energy audit conducted for non-SMEs, and no energy audits were provided for SMEs. These energy audits encompass data from the year 2019, with the energy audit conducted in 2021.

The pie chart shows that non-SMEs primarily consume electricity, accounting for 86% (4,203,667 kWh) of their energy use, and diesel oil, comprising 14% (676,633 kWh). Natural gas, LPG, and heavy oil are not used at all.

No energy audits were provided for SMEs from Bulgaria, so their energy consumption data is not available.

Overall, the chart highlights a significant reliance on electricity and diesel oil for non-SMEs, with no usage of natural gas, LPG, or heavy oil. The absence of data for SMEs means no comparison can be made for their energy consumption patterns.

*Comparison of Energy Breakdown (in kWh and percentage) in NACE H between Non-SME and SME's in Greece (Excluding Transport)*
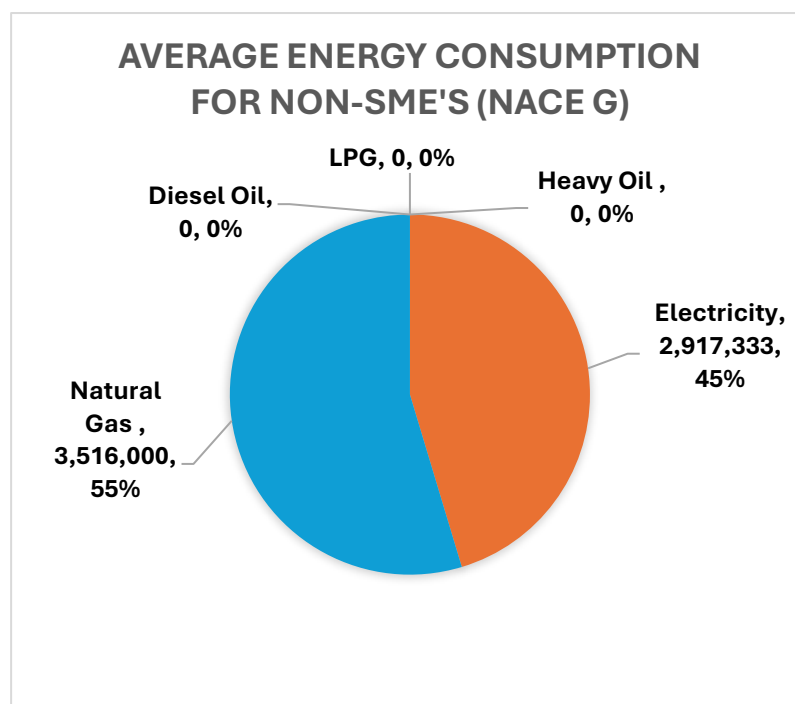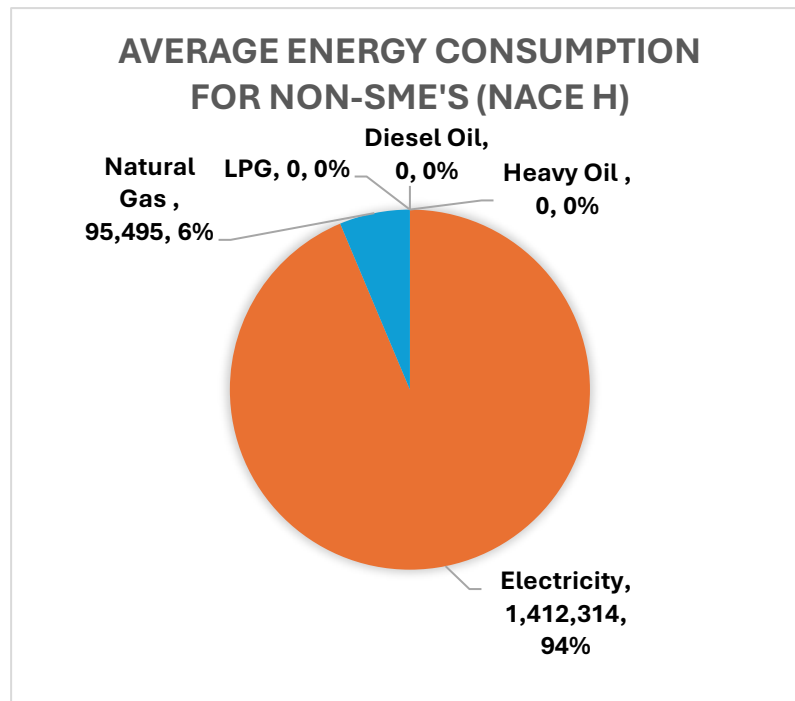


*Figure 13- Comparison of Energy Breakdown in NACE H between Non-SME and SME's in Greece (Excluding Transport)*

The pie chart illustrates the average energy consumption for Non-SMEs in NACE H from Greece, based on data from energy audits. There was one energy audit conducted for non-SMEs, and no energy audits were provided for SMEs. These energy audits encompass data from 2019, with the energy audit conducted in 2021.

The pie chart shows that non-SMEs primarily consume electricity, accounting for 94% (1,412,314 kWh) of their energy use, and natural gas, comprising 6% (95,495 kWh). Diesel oil, LPG, and heavy oil are not used at all.

No energy audits were provided for SMEs from Greece, so their energy consumption data is unavailable.

Overall, the chart highlights a significant reliance on electricity and a smaller but notable use of natural gas for non-SMEs, with no usage of diesel oil, LPG, or heavy oil. The absence of data for SMEs means no comparison can be made for their energy consumption patterns.

## Comparison of Energy Breakdown (in kWh and percentage) in NACE H between Non-SME and SME's in Ireland (Excluding Transport)
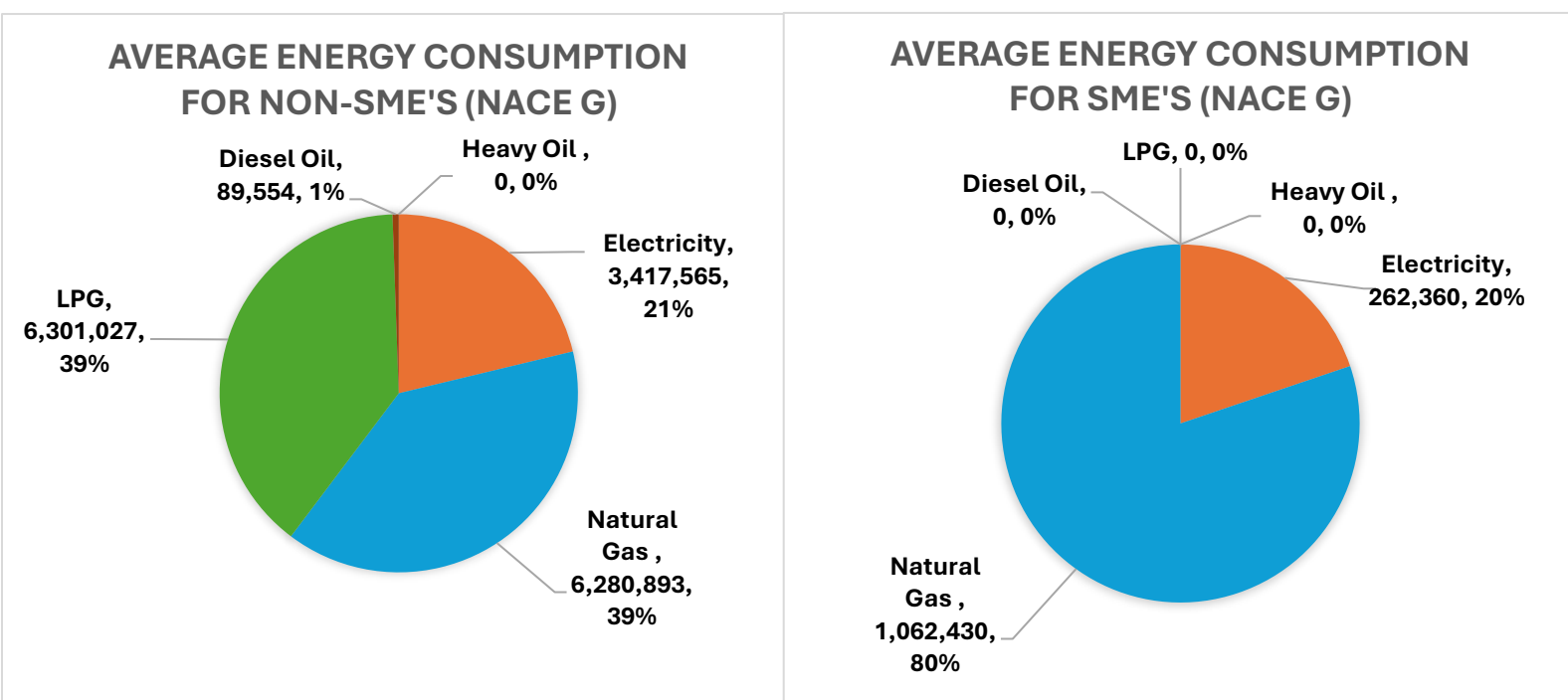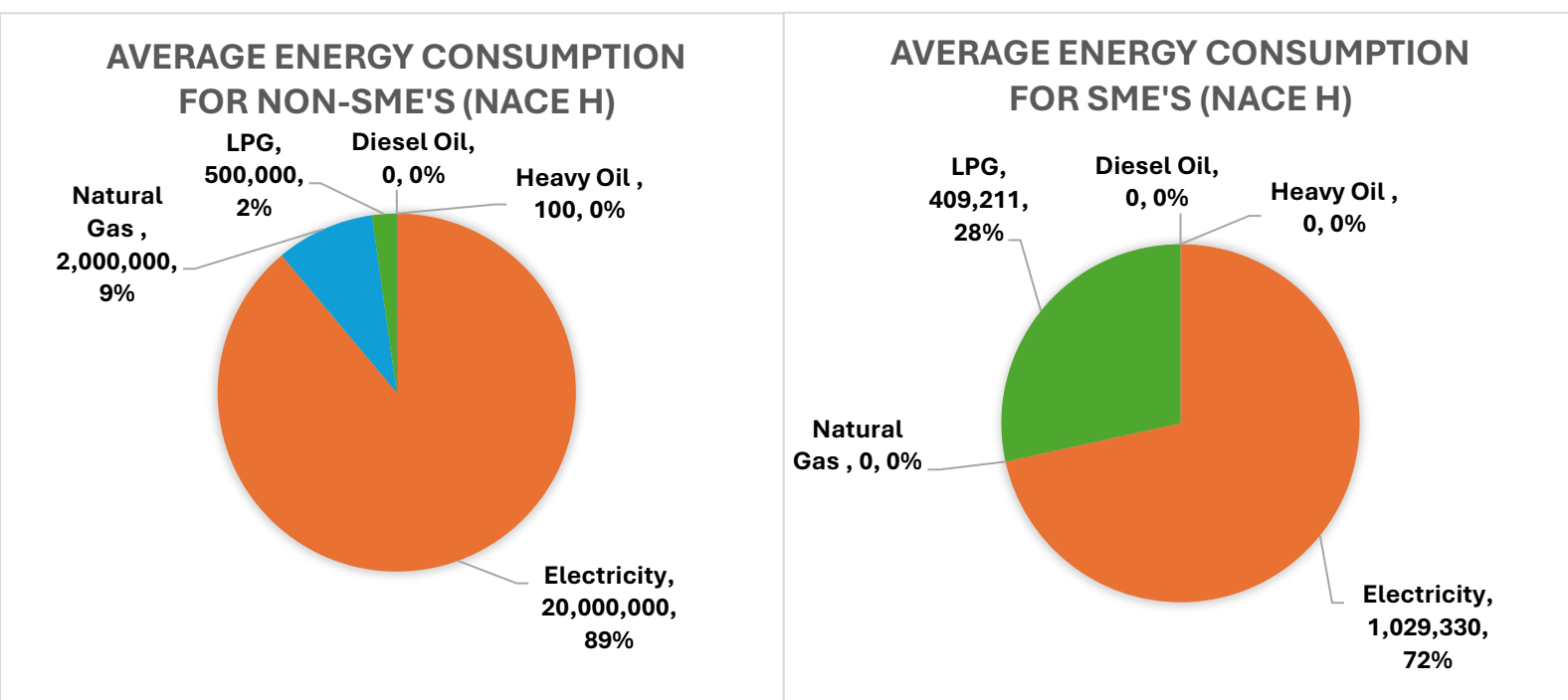


*Figure 14- Comparison of Energy Breakdown in NACE H between Non-SME and SME's in Ireland (Excluding Transport)*

The two pie charts illustrate the average energy consumption for non-SMEs and SMEs in NACE H from Ireland, based on data from energy audits. There was one energy audit conducted for non-SMEs and five for SMEs. These energy audits encompass data from the years 2022 to 2023, with the energy audits conducted between 2023 and 2024.

The first pie chart shows that non-SMEs primarily consume electricity, accounting for 89% (20,000,000 kWh) of their energy use, followed by natural gas at 9% (2,000,000 kWh) and LPG at 2% (500,000 kWh). Diesel oil and heavy oil are not used at all.

The second pie chart shows that SMEs primarily consume electricity, accounting for 72% (1,029,330 kWh) of their energy use, followed by LPG at 28% (409,211 kWh). Diesel oil, heavy oil, and natural gas are not used at all.

Overall, the charts highlight different energy consumption patterns between non-SMEs and SMEs. Non-SMEs rely heavily on electricity, with notable contributions from natural gas and LPG, while SMEs primarily rely on electricity with a significant portion of their energy use coming from LPG. Both non-SMEs and SMEs show no usage of diesel oil, heavy oil, or natural gas.

# Energy Audits in Transport

Most of the energy audits failed to include the specific types of fuels used (such as electric, petrol, diesel, natural gas, and LPG) and the total kilometers travelled by the fleet. This missing data, such as km travelled and fuel consumption, is likely due to the difficulty in gathering and tracking this information. Additionally, one of the reasons why much of the transport data was not listed could be that some companies do not have their fleet or do not use third-party fleets. This omission creates a significant gap in the audit reports, making it difficult to indicate and assess the different fuel usage across various NACE sectors and sizes of enterprises. Without this information, it is challenging to analyse fuel consumption patterns and efficiency and identify opportunities. Furthermore, the available transport consumption data cannot be presented by individual countries but rather as NACE sectors encompassing all countries. This is because, in some instances, there is only a single data point from certain countries, which limits the ability to analyse and present country-specific data accurately. The data will, therefore, be split by NACE sector and enterprise size instead.
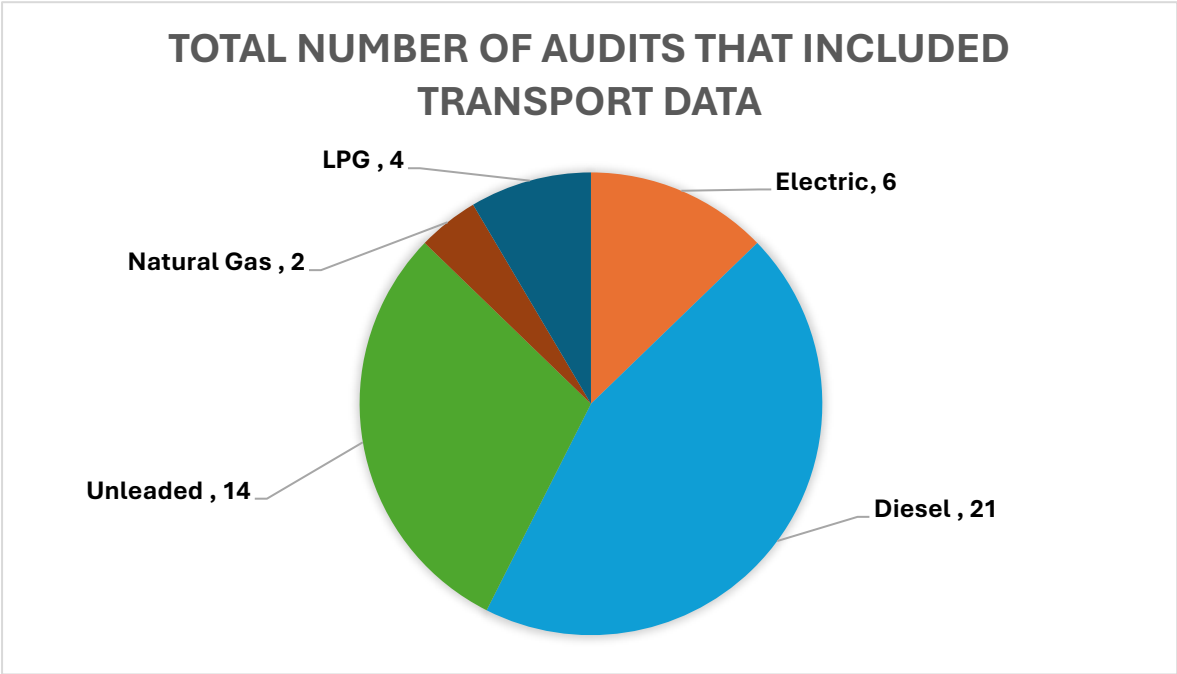


*Figure 15- Total Number of Audits that included transport data*

Out of the 129 energy audits conducted, only 47 included transport data such as types of fuel the transport used and kilometers travelled. The breakdown of these audits is detailed in the accompanying pie chart: 6 audits included data on electric transport, accounting for

approximately 4.65% of the total audits. Diesel transport data was included in 21 audits, making up about 16.28%. Unleaded transport data featured in 14 audits, representing around 10.85%. Natural gas transport data was included in 2 audits, which is about 1.55%. Finally, LPG transport data was present in 4 audits, accounting for approximately 3.10% of the total. This shows that diesel transport data was the most frequently included, while natural gas transport data was the least common in the energy audits.

## *Fuels used in Transportation by Non-SME and SME's in Nace C (Analysis in kWh and percentage)*

**AVERAGE VEHICLE CONSUMPTION FOR NON-SME'S FOR NACE C**

LPG, 110546, 6%
Electricity , 0, 0%
Natural Gas , 652, 0%
Unleaded, 286204, 15%
Diesel , 1506276, 79%

**AVERAGE VEHICLE CONSUMPTION FOR SME'S FOR NACE C**

Natural Gas , 0, 0%
LPG, 21505, 3%
Electricity , 7710, 1%
Unleaded , 59142, 9%
Diesel , 575128, 87%
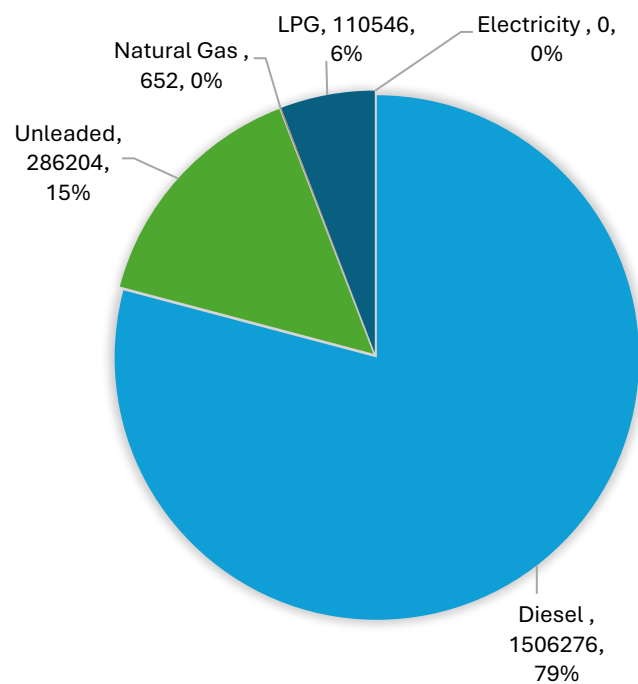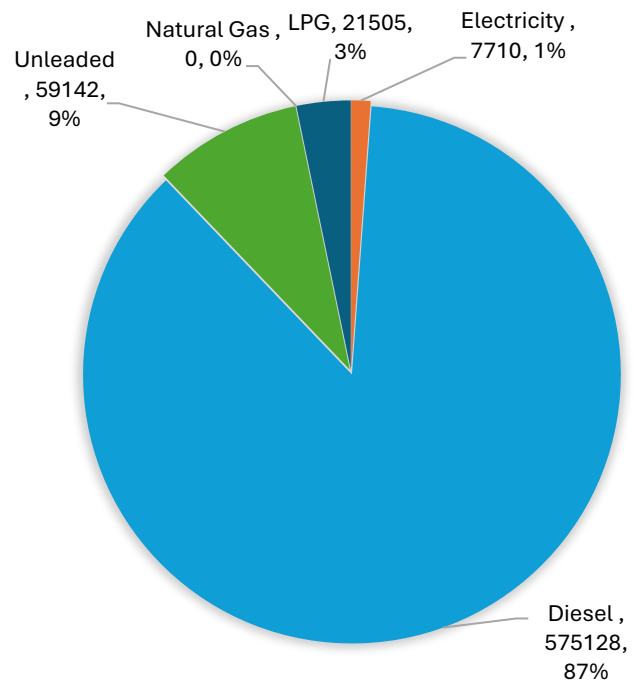
*Figure 16- Fuels used in Transportation by Non-SME and SME's in Nace C*

**Note: The values represented in the pie chart are measured in kilowatt-hours per year (kWh/year).**

| A total of 21 energy audits included transport data for NACE C, with Non-SMEs accounting for 9 and SMEs for 12 audits. | | |
|---|---|---|
| | **Non-SME's** | **SME's** |
| **Electricity** | 0 | 2 |
| **Diesel** | 5 | 4 |
| **Unleaded** | 3 | 2 |
| **Natural Gas** | 0 | 0 |
| **LPG** | 1 | 1 |

When comparing the average vehicle fuel consumption between SMEs and Non-SMEs for NACE C, Non-SMEs predominantly rely on diesel, which constitutes the highest consumption at 1,506,276 kWh. Conversely, SMEs use diesel as their primary fuel source as well, but with a significantly lower consumption of 575,128 kWh. In terms of electricity, SMEs consume 7,710 kWh, while non-SMEs do not use electricity at all for vehicle consumption. Neither SMEs nor non-SMEs consume natural gas. LPG consumption is notable in both categories, with non-SMEs using 110,546 kWh compared to SMEs' 21,505 kWh. Additionally, unleaded fuel consumption is higher in non-SMEs at 286,204 kWh, compared to 59,142 kWh in SMEs. This analysis highlights the substantial reliance on diesel among both non-SMEs and SMEs, with non-SMEs exhibiting a higher and more diverse energy consumption pattern overall.

*Fuels used in Transportation by Non-SME and SME's in Nace G (Analysis in kWh and percentage)*



AVERAGE VEHICLE CONSUMPTION FOR NON-SME'S FOR NACE G

Unleaded, 102662, 8%
Natural Gas , 0, 0%
LPG, 7737, 0%
Electricity , 0, 0%
Diesel , 1215924, 92%

AVERAGE VEHICLE CONSUMPTION FOR SME'S FOR NACE G

Natural Gas , 1003, 0%
LPG, 0, 0%
Unleaded, 293900, 12%
Electricity , 128946, 5%
Diesel , 2056430, 83%
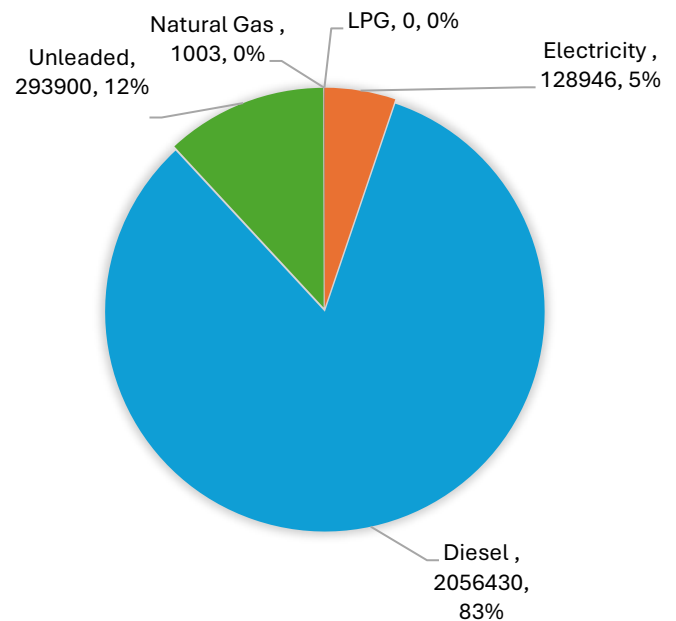
*Figure 17- Fuels used in Transportation by Non-SME and SME's in Nace G*

**Note: The values represented in the pie chart are measured in kilowatt-hours per year (kWh/year).**

**Important Note: The data presented does not account for all 129 energy audits due to missing information in the transport section. The total number of energy audits for NACE G is detailed in the table below:**

| Nace G total energy audits that include transport | | |
|---|---|---|
| | **Non-SME's** | **SME's** |
| **Electricity** | **0** | **1** |

| | | |
|---|---|---|
| **Diesel** | 6 | 1 |
| **Unleaded** | 5 | 1 |
| **Natural Gas** | 1 | 0 |
| **LPG** | 1 | 0 |

When comparing the average vehicle fuel consumption between SMEs and Non-SMEs for NACE G, SMEs predominantly rely on diesel, which constitutes the highest consumption at 2,056,430 kWh (83%). Conversely, non-SMEs use diesel as their primary fuel source as well, but with a significantly lower consumption of 1,215,924 kWh (92%). Regarding electricity, SMEs consume 128,946 kWh (5%), while non-SMEs do not use electricity at all for vehicle consumption. For lesser-used fuels, the consumption of natural gas is minimal, with SMEs using only 1,003 kWh and non-SMEs not using it at all. LPG consumption is present in non-SMEs, with 7,737 kWh consumed, whereas SMEs do not consume LPG. Additionally, unleaded fuel consumption is higher in SMEs at 293,900 kWh (12%), compared to 102,662 kWh (8%) in non-SMEs. This analysis highlights the substantial reliance on diesel among non-SMEs and SMEs, with SMEs exhibiting a higher and more diverse energy consumption pattern overall.

*Fuels used in Transportation by Non-SME and SME's in Nace H (Analysis in kWh and percentage)*

## AVERAGE VEHICLE CONSUMPTION FOR NON-SME'S FOR NACE H

Unleaded, 941, 0%
Natural Gas , 300, 0%
LPG, 300, 0%
Electricity , 10,000,000, 6%
Diesel , 169369917, 94%
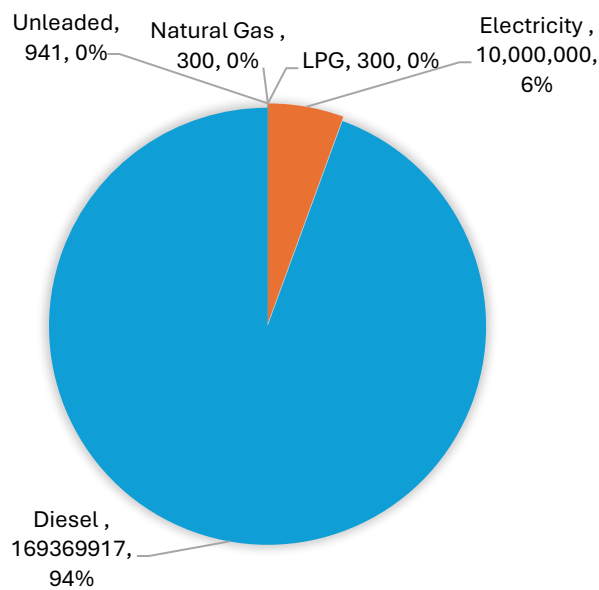
## AVERAGE VEHICLE CONSUMPTION FOR NACE H SME

Natural Gas , 0, 0%
Unleaded, 93711, 5%
LPG, 0, 0%
Electricity , 25622, 2%
Diesel , 1606357, 93%
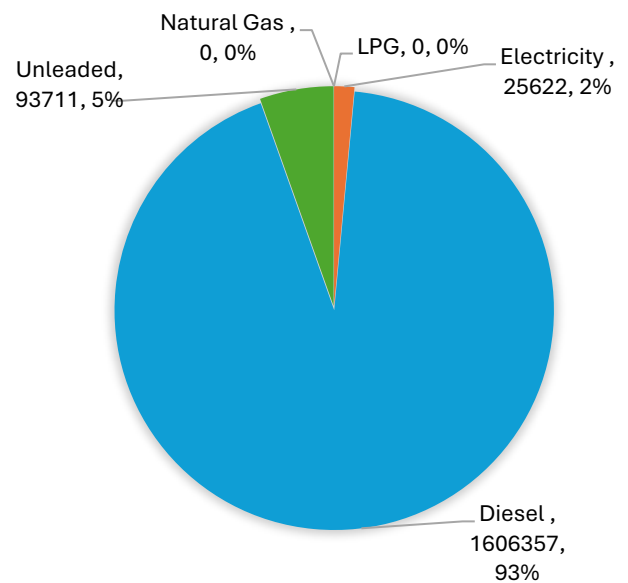
*Figure 18- Fuels used in Transportation by Non-SME and SME's in Nace H*

**Important Note: The data presented does not account for all Nace H energy audits due to missing information in the transport section. The total number of energy audits for NACE H is detailed in the table below:**

| Nace H total energy audits that include transport | | |
|---|---|---|
| | **Non-SME's** | **SME's** |
| **Electricity** | 1 | 2 |

| | | |
|---|---|---|
| **Diesel** | 4 | 1 |
| **Unleaded** | 2 | 1 |
| **Natural Gas** | 1 | 0 |
| **LPG** | 1 | 0 |

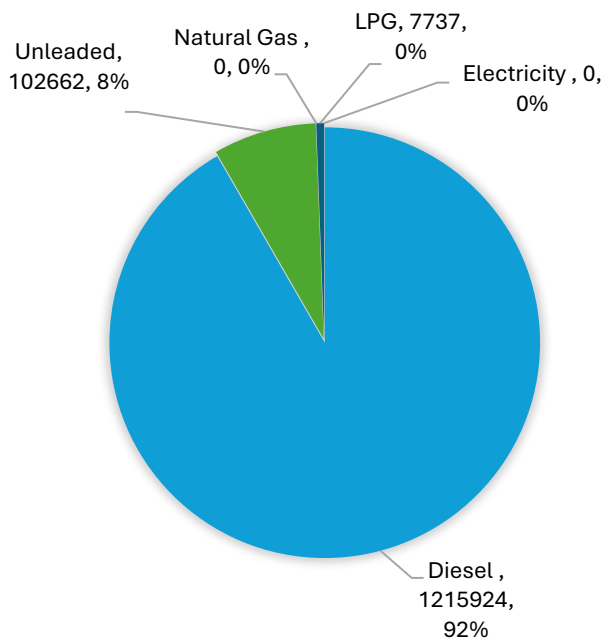When comparing the average vehicle fuel consumption between SMEs and Non-SMEs for NACE H, Non-SMEs predominantly rely on diesel, which constitutes the highest consumption at 16,936,917 kWh (94%). Conversely, SMEs use diesel as their primary fuel source as well, with a consumption of 1,606,357 kWh (93%). In terms of electricity, non-SMEs consume 10,000,000 kWh (6%), while SMEs consume 25,622 kWh (2%). Unleaded fuel consumption is higher in SMEs at 93,711 kWh (5%), compared to 941 kWh (0%) in non-SMEs. For lesser-used fuels, non-SMEs have minimal consumption of natural gas and LPG, each at 300 kWh, whereas SMEs do not consume natural gas or LPG at all. This analysis highlights the substantial reliance on diesel among non-SMEs and SMEs, with non-SMEs exhibiting a higher and more diverse energy consumption pattern overall.

# Key Performance Indicators (KPI's)

Upon reviewing the provided KPIs for the production process and transport, it has been observed that the dataset is significantly incomplete. The KPIs are not comprehensively mentioned, resulting in a lack of critical data needed for thorough analysis. Additionally, essential information, such as production levels, is missing, which is crucial for understanding the overall output and efficiency of the production process. These deficiencies in the dataset hinder the ability to accurately determine the current state of energy management and identify potential areas for improvement.

*Table 2- Specific Energy Consumption Denominator*

| Nace Code | Specific Energy Consumption Denominator |
|---|---|
| C10 | The Most Common KPI is energy consumption per Tonne of final product |
| C11 | The Most Common KPI is energy consumption per Hectaliters and Liters of product produced |
| G46 and G47 | The Most Common KPI is energy consumption per Floor Area or Number of Customers |
| H | It is not feasible to establish a common KPI for NACE H due to two main factors: a) the limited number of audits collected from this NACE category, and b) the absence of relevant KPIs in the available audit data. |

# Energy Efficiency and Renewable Energy

The energy efficiency recommendations were categorised to make it easier to manage and identify the most common ones across various nace codes. Each recommendation from the energy audit was reviewed and grouped into clear categories. In total, there were around 515 recommendations across all Nace codes. The following categories were adopted:

1. Renewable Systems: This includes recommendations related to renewable energy sources like solar panels and biogas systems.

2. Heating, Ventilation, and Air Conditioning (HVAC): This covers improvements to heating and cooling systems, such as upgrading air conditioners and installing heat recovery units.

3. Lighting: This category includes recommendations related to lighting, like switching to LED lights and installing daylighting systems.

4. Electrical and Mechanical Systems: This includes recommendations for improving electrical and mechanical equipment, like upgrading electric motors and installation of variable speed drives.

5. Transportation and Fleet Management: This category suggests ways to make vehicle use more efficient, like training for eco-driving, maintaining proper tire pressure, and using electric or hybrid vehicles.

6. Building and Infrastructure Improvements: This includes structural improvements to buildings, like better insulation and installing shading devices.

7. Refrigeration: This category focuses on making refrigeration systems more efficient, such as upgrading to more efficient units and optimising cooling processes.

8. Monitoring and Management Systems: This includes recommendations for setting up systems to monitor and manage energy use, like installing energy management systems.

9. Compressed Air: This category involves optimising compressed air systems, such as repairing leaks, upgrading to more efficient compressors, and implementing air pressure management strategies.

By organising the recommendations into these categories, it becomes easier to understand and implement each type of improvement. This structured approach ensures that all energy-saving measures are effectively managed and put into action.

We also categorised the cost of investments and payback periods to better prioritise and evaluate the recommendations. The costs were divided into four categories: No cost, Low (less than €6,500), Medium (between €6,500 and €120,000), and High (above €120,000). This makes it easy to see the financial impact of each recommendation. Similarly, the payback periods were categorised into Immediate (0 years), Short (up to 2 years), Medium (2 to 5 years), and Long (more than 5 years) to help assess the time needed to recover the investment. The energy savings values

were divided into three categories: Category I for companies with kWh consumption less than or equal to 500,000, Category II for those consuming more than 500,000 but less than 5,000,000 kWh, and Category III for those exceeding 5,000,000 kWh. The ranges used for categorising financial savings are as follows: ''Savings Present but Not Quantified" for actions resulting in savings that cannot be accurately calculated; "Low Savings" for amounts between €1 and €10,000; "Medium Savings" for amounts between €10,001 and €50,000; and "High Savings" for amounts above €50,000. These categorisations allow for a structured and strategic approach to implementing energy efficiency measures, helping businesses make informed decisions based on both cost and time to benefit. Additionally, we noticed multiple similar or identical recommendations, so we combined these into single entries.

Furthermore, we looked at the most frequently mentioned recommendations across all nace codes within categories C, G, and H, including their sub-categories. From the dataset, we found that the most common recommendations were HVAC replacement, installing energy-efficient lighting, upgrading compressors, performing regular maintenance on equipment, installing variable speed drives on motors and driver training courses on how to consume less fuel. This shows where energy efficiency improvements are most often recommended, highlighting key opportunities for businesses to enhance their energy management practices. The categorised tables can be found in Table 3:

## Renewable Installations

The renewable energy recommendations include primarily recommendations to install (PV) systems and other renewable technologies. These PV systems come in different sizes, with some installed-on building roofs and others across multiple buildings. Additionally, other types of renewable energy systems were identified:

- Cogeneration systems
- Biomass steam boilers

The PV systems have capacities ranging from as small as 11.84 kWp to as large as 2,200 kWp. The costs for these PV systems vary widely, from 15,438 Euros to 3,000,000 Euros, depending on factors such as system size, technology used, installation complexity, and location.

For other renewable energy systems:

- Cogeneration systems can have capacities of up to 200 kWe.
- Biomass steam boilers have been identified with a capacity of 4,000 kg/h.

Although the detailed costs for these other renewable energy systems are not fully available, the cost ranges provided indicate that larger installations would require significant investments, reflecting their scale and potential benefits.

*Table 3- Summary of Recommendations by Category*

| Category - Heating - Ventilation and Air Conditioning (HVAC) | | | | | |
|---|---|---|---|---|---|
| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
| G47 | Switch off AC unit when closed | No cost | / | Savings Present but Not Quantified | Immediate |
| G47 | Increasing AC temp from 23 deg to 26 deg for winter months. | No cost | Category I | Savings Present but Not Quantified | Immediate |
| C10 | Cleaning and maintenance of filters | No cost | Category I | Low | Immediate |
| H49 | Offices and heating: get efficiency at next service. Ensure radiators are set to 3 max and thermostats to 19 DegC | No cost | Category I | Low | Immediate |
| G47 | Installation of Air curtains including night curtains on open cases | Low | / | Savings Present but Not Quantified | Short / Medium |
| G47 | To install VRF Units at the end of life of current split-airconditioning units | Low / Medium | / | Savings Present but Not Quantified | Short / Medium /Long |

| C10 | HVAC Implementing Occupancy Sensors | Low | / | Savings Present but Not Quantified | Medium / Long |
|------|------|------|------|------|------|
| G47 | Replacement of upright curtain chillers with new more efficient ones | Low | Category I | Low | Short |
| G46 | Install motion sensors for AC units | Low | Category I | Low | Long |
| C10 | Ventilation system, heat-recovery | Low | / | Savings Present but Not Quantified | Short |
| G46 | Installation of inverter on ventilation fans | Low | Category I | Low | Short |
| G47 | Installation of air curtain at supermarket entrance | Low | Category I | Low | Long |
| G47 | Installation of PVC curtains at doorways | Low | Category I | Low | Medium |
| G46 | Installation of inverter for Central Air Handing Unit | Low | Category I | Low | Medium |

| C10 / C11 | Insulation of uninsulated steam pipes, valves and boiler surfaces | Low / Medium | / | Savings Present but Not Quantified | Short |
|---|---|---|---|---|---|
| G47 | Cleaning of chiller condenser heat exchange surfaces | Low | Category I | Low | Short |
| C10 | Replacement of ventilation fans with new VSD fans | Low | Category I | Low | Medium |
| C10 | HVAC upgrade - Replacement of non-inverter type units with high-efficiency inverter units. | Medium | Category I | Low | Long |
| G46 | Installation of heat recovery Units | Medium | Category I | Savings Present but Not Quantified | / |
| G46.3 | Replacing AC Split Units with Variable Speed Type | Medium | Category I | Low | Long |
| G47 | Glass Doors / Night Curtains on Open Spaces | Medium | / | Low | Medium |
| G47 | Installing Night Curtains on open cases | Medium | / | Low | Long |

| | | | | | |
|---|---|---|---|---|---|
| C10 | HVAC - Changing from a fixed speed pump to a variable speed pump | Medium | Category III | Low | Long |
| C10 | Upgrading of ACs | Medium | / | Low | Medium |
| C10 | Other measures, heat-recovery from ovens | Medium/High | Category II | Medium | Short/Medium |
| C10 | Pneumatic system, heat-recovery | Medium | Category I | Low | Medium |
| C10 | Replacement of the heavy oil burners of the steam boilers with natural gas burners | Medium | Category II | Medium | Medium |
| C11 | Replacement of ventilation fans with new, VSD fans and the simultaneous installation of indoor temperature sensors | Medium | Category I | Low | Short |
| C11 | Replacement of the compressors of the ammonia chillers with new, inverter-type compressors | Medium | Category I | Low | Medium |
| C10 / C11 | Installation of flue gas waste recovery heat exchanger | Medium | Category I | Medium | Medium / Long |

| | | | | | |
|---|---|---|---|---|---|
| C11 | Replacement of old chiller with new chillers with inverters | Medium | / | Medium | Medium |
| C10 | Replacement of A/C units with new A/C units with inverter motors | Medium | Category I | Low | Long |
| C11 | Waste heat recovery from ammonia chiller condensers | Medium | Category II | High | Short |
| C10 | Retrofit Ventilation System Drive: New Transmission and Magnetic Reluctance Motors | Medium | Category I | Medium | Medium |
| C11 | Replacement of the bottling chiller with a more efficient one. | Medium | / | Savings Present but Not Quantified | Medium |
| C11 | Installation of a heat pump to heat hot water for the process. | Medium | / | Savings Present but Not Quantified | Long |
| C11 | Reducing thermal energy consumption in the fermentation and stabilisation vats by improving the thermal insulation of the surroundings (roof and walls). | Medium | Category I | Low | Long |
| C10 | Retrofitting of Two stages evaporative cooling | High | Category I | High | Medium |

| Nace Code | Description | Investment Level | Energy savings | Financial savings | Payback Period Level |
|---|---|---|---|---|---|
| C11 | New Chiller | High | Category I | Medium | Long |
| C11 | New Boiler | High | Category II | Medium | Long |
| C10 / C46 | Cooling systems, heat-recovery | High | / | Savings Present but Not Quantified | Long |
| G46 | Ventilation system, heat-recovery | High | Category II | Medium/High | Medium/Long |
| C10 | 1. Flue gas waste heat recovery from steam and thermal oil boilers<br>2. Waste heat recovery from rejected steam<br>3. Waste heat recovery from chiller condensers | High | / | High | Medium |
| C10 | Activity Energy Efficiency on Screw Compressors. N11 and n6 | High | Category I | High | Medium |

| | **Category - Lighting** | | | | |
|---|---|---|---|---|---|
| **Nace Code** | **Description of energy efficiency recommendation** | **Investment Level** | **Energy savings (kWh/year)** | **Financial savings (Euros/year)** | **Payback Period Level** |

| Nace Code | Description | Investment Level | Energy savings | Financial savings | Payback Period Level |
|---|---|---|---|---|---|
| G46 | Installation of a lighting control system with presence and natural lighting detectors | Low | Category I | Low | Short |
| C/G/H | Switch lighting to LED | Low / Medium | / | High | Short / Medium / Long |
| G47 | Lighting Replacement using Light Tubes and LED Fittings | Medium | / | High | Long |
| G47 | Daylighting using Light Tubes in the main hall | Medium | / | Low | Long |
| H49 | VPC lighting upgrade to LED and Lux reduction | Medium | Category I | Medium | Medium |
| **Category - Electrical and Mechanical Systems** | | | | | |
| **Nace Code** | **Description of energy efficiency recommendation** | **Investment Level** | **Energy savings (kWh/year)** | **Financial savings (Euros/year)** | **Payback Period Level** |
| G47 | To switch off equipment when not in use | No cost | / | Savings Present but Not Quantified | Immediate |

| | | | | | |
|---|---|---|---|---|---|
| G47 | Installation of presence detectors in storage areas | Low | Category I | Low | Medium |
| C10 / G47 | Installation of PFC unit | Low / Medium | / | Savings Present but Not Quantified | Short / Medium |
| C10 | Installation of harmonic filters | Medium | / | Savings Present but Not Quantified | Medium |
| C10 | Ancillaries - Small Power - Replacement of old appliances and installation of RO. | Medium | Category III | Low | Medium |
| C10 | Installation of eight (8) electrical metering points | Medium | Category I | Low | Medium |
| C10 (C10) | Retrofit Ventilation drive: New transmission and magnetic reluctance motors | Medium | Category I | Medium | Medium |
| C10 | Retrofit of electric motors with at least 3000hrs/year | Medium | Category I | Medium | Medium |
| C11 | VSD on all pumps | Medium | / | Medium | Long |

| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
|---|---|---|---|---|---|
| C11 | Replace motors <6kW with an IE1 rating with new motors with an IE3 rating | Medium | Category I | Low | Long |
| C10 | Replacement of old motors with new motors (inverters) or upgrade of existing ones | Medium | Category I | Low | Long |
| C10 | Replacement of old motors with new motors with a rating of IE4 | High | Category I | Medium | Medium |
| C10 | High-efficiency tri-generation 305kW | High | Category II | High | Medium |
| **Category - Transportation and Fleet Management** | | | | | |
| **Nace Code** | **Description of energy efficiency recommendation** | **Investment Level** | **Energy savings (kWh/year)** | **Financial savings (Euros/year)** | **Payback Period Level** |
| C10 | Keeping the tyres of vehicles properly inflated | No cost | Category III | Low | Immediate |
| G46 | Eco-driving training | No cost/Low | Category I | Savings Present but Not Quantified | Immediate/Short |

| G46 | Improvement of vehicle maintenance protocol | No cost | / | Savings Present but Not Quantified | Immediate |
|------|------|------|------|------|------|
| G46 | Improvement of vehicle routes | No cost | / | Savings Present but Not Quantified | Immediate |
| H49 | Tighter fuel reporting: Get more organised to save Km and fuel; use existing tools (apps, expense reporting, salesforce, fuel cards to automate processes and simplify) | No cost | Category I | Medium | Immediate |
| H49 | Ensure TPMS - Tyre Pressure Monitoring Systems - are calibrated and used (weekly) | No cost | Category I | Low | Immediate |
| H49 | Specify A-rated tyres for fuel performance in maintenance contracts | No cost | Category I | Low | Immediate |
| H49 | Not all work can be done by cargo bikes, but some can. | No cost | / | Savings Present but Not Quantified | Immediate |
| H49 | Maintain correct tyre pressures 1-3% saving 1% assumed | No cost | Category I | Savings Present but Not Quantified | / |
| H49 | Specify Low Rolling Resistance tyres 3-5% saving 3% assumed | No cost | Category I | Savings Present but Not Quantified | / |

| | | | | |
|---|---|---|---|---|
| H49 | Introduce no-idling policy (base savings on 0.5/Hr) | No cost | / | Savings Present but Not Quantified | / |
| H49 | Slow down - adhere to speed limits - use cruise control | No cost | / | Savings Present but Not Quantified | / |
| H49 | Adjust aerodynamic aids to reduce parasitic drag | No cost | / | Savings Present but Not Quantified | / |
| H49 | Remove roof-mounted racks & spots wherever possible | No cost | / | Savings Present but Not Quantified | / |
| H49 | Ensure vehicle spec. meets business needs | No cost | / | Savings Present but Not Quantified | / |
| H49 | Use existing tools - Telematics, Fuel Card, Smart Meters (c.5%) | No cost | Category I | Savings Present but Not Quantified | Immediate |
| C10 | Modifying gasoline-powered vehicles to work on LPG | Low | Category III | Low | Medium |
| H49 | ECO driving training / awareness raising can deliver 3-5% savings per annum | Low | Category I | Medium | Short |

| H49 | Specify new vehicles with semi-auto transmissions, cruise control and speed limited to 100 kph or less | Low | Category I | Savings Present but Not Quantified | / |
|------|------|------|------|------|------|
| G46 | Replacement of leased vehicles with new leased electrical vehicles | Medium | Category I | Medium | Short |
| H49 | Choose a car club or similar hourly hire instead (€10/hr vs avg €10,000/year for owed | Medium | / | High | Short |
| C11 | Replacement of two LPG forklifts with electric ones. | Medium | / | Low | Long |
| C11 | Replacing vehicles (light goods vehicles) with combustion engines with electric ones. | Medium | / | Low | Long |
| H49 | Energy Recovery Brakes | Medium | Category II | High | Short |
| H49 | Driver training | Medium | Category III | High | Short |
| H49 | Maintenance | Medium | Category II | High | Short |

| H49 | Throttle Management | Medium | Category II | High | Short |
|------|---------------------|--------|-------------|------|-------|
| H49 | Train Handling Techniques | Medium | Category II | High | Short |
| H49 | Idling Controls | Medium | Category II | High | Short |
| H49 | Ranked performance | Medium | Category I | Low | Medium |
| H49 | Choose electric - all vehicles look suitable | High | Category II | High | Medium |
| H49 | Capture odometer readings at the point of fuel purchase | High | Category I | Savings Present but Not Quantified | / |
| H49 | Identify the most fuel-thirsty vehicles and duty cycles | High | Category I | Savings Present but Not Quantified | / |
| H49 | Key operator (drivers) training - ECO drive c.5% saving with weekly feedback. | High | Category I | Savings Present but Not Quantified | / |

| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
|---|---|---|---|---|---|
| H49 | Consider alternate PTO e.g., electric-powered chargers for drones and other equipment | High | / | Savings Present but Not Quantified | / |
| H49 | Get control of baseload use and MIC excesses first; then look to install and use solar PV to charge cars (exports will be at wholesale prices, sales to the customer at retail prices i.e. exports = losses | High | Category I | High | Long |
| H49 | Fuel Additive | High | Category II | High | Short |
| H49 | Notch 8 Limiters | High | Category III | High | Short |
| **Category - Renewable Systems** | | | | | |
| **Nace Code** | **Description of energy efficiency recommendation** | **Investment Level** | **Energy savings (kWh/year)** | **Financial savings (Euros/year)** | **Payback Period Level** |
| C10 | PV Cleaning -Regular cleaning is also very important since dust accumulation can decrease the system's output by up to 30%. | No cost | / | Savings Present but Not Quantified | Immediate |
| C/G/H | Installation of a photovoltaic system | Medium / High | / | Savings Present but Not Quantified | Medium / Long |

| | | Category - Compressed Air | | | |
|---|---|---|---|---|---|
| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
| C10 | Improvements in Compressed Air system (Reduce -waste due to improper control and unloading energy, waste due to efficiency at higher pressure, waste due to leaks reduction at lower pressure.) | No cost | Category I | Medium | Immediate |
| C10 | Compressed air system reducing pressure by 0.5bar | No cost | / | Savings Present but Not Quantified | Immediate |
| H49 | Compressed air pipework is to be checked for leaks and timers are to be used for on/off | No cost | / | Savings Present but Not Quantified | Immediate |
| G46 | Pressure reduction of compressed air system and detection of leaks | Low | Category I | Low | Short |
| C10 | Reducing air inlet temperature of compressor | Low | Category I | Low | Medium |
| C10 / C10 / C11 | Energy recovery for compressor | Low / Medium | / | Savings Present but Not Quantified | Short / Medium |

| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
|---|---|---|---|---|---|
| C10/C10 | Reduction of compressed air system leaks | Low / Medium | / | Savings Present but Not Quantified | Medium / Long |
| C10 | Optimisation of air compressor settings and operation | Medium | / | Savings Present but Not Quantified | Short / Medium |
| C10 | Upgrading to a variable-speed drive compressor | Medium | Category I | Low | Medium |
| C10 | Compressed air system optimisation with compressor replacement | Medium | Category I | Medium | Medium |
| C11 / C11 | Replacement of air compressor with new variable speed compressor | Medium | / | Savings Present but Not Quantified | Long |
| C11 | Replacement of air compressors with new inverter-type compressors | Medium | Category I | Low | Long |
| **Category - Monitoring and Management Systems** | | | | | |
| **Nace Code** | **Description of energy efficiency recommendation** | **Investment Level** | **Energy savings (kWh/year)** | **Financial savings (Euros/year)** | **Payback Period Level** |

| | | | | |
|---|---|---|---|---|
| G46 | Awareness raising campaign | No cost | / | Savings Present but Not Quantified | Immediate |
| H49 | Implement energy awareness campaign (5% of buildings surveyed) | Low | Category I | Savings Present but Not Quantified | Immediate |
| G46 | Installation of energy monitoring system | Low | / | Savings Present but Not Quantified | Short / Medium |
| G46 | Installation of IoT energy management system | Low | Category I | Low | Medium |
| H49 | Consider ISO50001 (with or without certification) Sum 1+3 | Medium | Category I | Savings Present but Not Quantified | Immediate |
| C10 / C11 / G47 | Installation of an IoT energy monitoring and management system | Low / Medium / Long | / | Savings Present but Not Quantified | Short / Medium / Long |
| C10 | Introduction of an automated system for managing the operation of steam boilers | Medium | Category III | High | Short |
| C11 | Monitoring and sub-metering | Medium | / | High | Short |

| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
|---|---|---|---|---|---|
| C10 / C11 / G47 / H49 | Introducing an energy management system | Medium | / | Savings Present but Not Quantified | Short / Medium / Long |
| C11 | Improve Industrial Control | High | / | High | Short |
| **Category - Refrigeration** | | | | | |
| **Nace Code** | **Description of energy efficiency recommendation** | **Investment Level** | **Energy savings (kWh/year)** | **Financial savings (Euros/year)** | **Payback Period Level** |
| G47 | To reduce the volume of refrigeration | No cost | / | Savings Present but Not Quantified | Immediate |
| G47 | Replacement of refrigeration units (Cost & savings quoted are for one unit) | Low | Category I | Low | Short |
| G47 | Installation of doors at industrial refrigerators | Low | Category I | Low | Medium |
| C11 | Insulation of uninsulated refrigeration and cooling piping | Low | Category I | Low | Short |

| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
|---|---|---|---|---|---|
| G47 | Replacement of refrigerator and freezer doors | Medium | Category I | Medium | Short |
| G46.3 | Shading and Ventilation of Condensers of Refrigeration Compressor Systems | Medium | Category I | Low | Long |
| G47 | Refrigeration - Change from R404 based system to a CO2 based system (R744) | High | / | Medium | Long |
| C10 | Optimisation On Refrigeration | High | Category III | High | Short |
| C10 | Retrofit of 3 compressors refrigerators by motor replacement and inverter installation | High | Category III | High | Short |
| C10 | Refrigeration Plant: Transformation From Single Stage To Bi-Stage | High | Category II | High | Short |

## Category - Building and Infrastructure Improvements

| Nace Code | Description of energy efficiency recommendation | Investment Level | Energy savings (kWh/year) | Financial savings (Euros/year) | Payback Period Level |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| H49 | Storage heating to be reset and all shown how to use controls | Low | / | Savings Present but Not Quantified | Immediate |
| C10.7 | Technical system insulations | Low | Category I | Low | Medium |
| C11 | RO System upgrade | Medium | / | High | Short |
| C10 / G47 | Building automation | Medium | / | Savings Present but Not Quantified | Short / Medium |
| G46 | Introduction of Skylights | Medium | Category I | Low | Long |
| C10 / C11 | Roof reflective white coating | Medium / High | / | Savings Present but Not Quantified | Medium / Long |